

John A. Cosmetic composition based on associative polyurethanes
and fatty-chain anionic polymers

The present invention relates to cosmetic compositions containing a novel system for thickening aqueous media based on associative polyurethanes and fatty-chain anionic polymers, as well as to their use as leave-in haircare gels or styling gels.

The thickening and/or gelation of aqueous media with polymers has been an important subject of cosmetic research for a long time. The production of an advantageous thickening effect with a water-soluble polymer generally assumes a high molar mass and a large hydrodynamic volume. The gelation of an aqueous medium is thus considered as the result of a three-dimensional polymer network obtained by crosslinking linear polymers or by copolymerizing bifunctional and polyfunctional monomers. However, the use of such polymers of very high molar mass poses a certain number of problems, such as the relatively unpleasant texture and the difficulty in spreading the gels obtained.

One advantageous approach consisted in using, as thickeners, polymers capable of reversibly associating with each other or with other molecules or particles. This physical association gives rise to thixotropic or rheofluidizing macromolecular systems,

i.e. systems whose viscosity depends on the shear forces to which they are subjected.

Such polymers capable of reversibly associating with each other or with other molecules are 5 known as "associative polymers". The interaction forces in play can be of very different nature, for example of electrostatic nature, of hydrogen-bond type or hydrophobic interactions.

One specific case of associative polymers is 10 amphiphilic polymers, i.e. polymers comprising one or more hydrophilic portions which make them soluble in water, and one or more hydrophobic zones via which the polymers interact and assemble with each other or with other molecules.

15 It is known practice to prepare hair compositions in gel form using, as thickening system, such associative amphiphilic polymers, in conjunction with surfactants. It is thought that the advantageous rheological properties of the gels thus obtained are 20 due to the formation of mixed micelles containing the surfactants and the hydrophobic portions of the amphiphilic polymers, these micelles constituting a multitude of physical crosslinking points.

However, these compositions based on 25 associative polymers and surfactants do not always have the desired cosmetic properties. Thus, the presence of surfactants, even in small amounts, can adversely modify the cosmetic properties of the said

compositions, such as the properties of application or of feel after drying. Moreover, in particular in the sector of leave-in care gels or styling gels, it is important to be able to distribute the product

5 uniformly over the entire head of hair so as to avoid the overloads and the cosmetic defects resulting therefrom.

European patent application EP-A-0,412,705 describes cosmetic compositions, in particular cosmetic
10 hair compositions, using, as thickening system, nonionic water-soluble polymers modified by introduction of fatty chains, in combination with one or more natural or synthetic water-soluble polymers.

French patent application FR-A-2,733,910
15 discloses compositions for styling mousses containing, in combination, at least one anionic polymer and at least one associative polyurethane, at least one of these two polymers having foaming power, so as to improve the properties of the mousses obtained.

20 It has now been discovered that it is possible to obtain a good thickening, or even gelling, effect and advantageous cosmetic properties by combining associative amphiphilic polyurethanes with anionic polymers comprising at least one fatty-chain
25 monomer unit.

The gel obtained by combining these two types of polymer has a very creamy texture and is pleasant to apply. The final feel on dried hair is more pleasant

and less laden. The gel moreover has excellent styling power.

One subject of the present invention is thus a cosmetic composition comprising at least one nonionic 5 associative polyurethane in combination with at least one anionic polymer comprising at least one fatty-chain monomer unit.

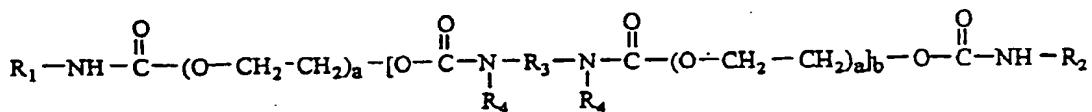
Another subject of the present invention is the use of the combination of at least one nonionic 10 associative polyurethane and at least one anionic polymer comprising at least one fatty-chain monomer unit, as a thickening system for cosmetic compositions.

A third subject of the invention is a cosmetic process for treating the hair using a cosmetic 15 composition obtained by combining at least one nonionic associative polyurethane and at least one anionic polymer comprising at least one fatty-chain monomer unit.

Other subjects will become apparent on 20 reading the description and the examples which follow.

The cosmetic compositions in accordance with the invention are essentially characterized in that they contain, in a cosmetically acceptable medium, (A) at least one amphiphilic nonionic associative 25 polyurethane corresponding to the general formula

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(I)

in which

one of the residues R_1 and R_2 represents a higher C_8-C_{18} alkyl group and the other represents a lower C_1-C_6 alkyl

5 group,

 R_3 represents a C_4-C_{36} , preferably C_6-C_{10} , hydrocarbon-based radical, R_4 represents a hydrogen atom or a C_1-C_6 alkyl radical, preferably a hydrogen atom,

10 a ranges, independently, from 90 to 600, and b is from 1 to 4, and

(B) at least one anionic polymer comprising at least one fatty-chain monomer unit.

According to the invention, the expression

15 "lower C_1-C_6 alkyl group" means an alkyl group containing a linear or branched chain comprising from 1 to 6 carbon atoms, such as methyl, ethyl, n-propyl, n-butyl, n-pentyl and n-hexyl radicals, as well as the corresponding branched isomers.20 In accordance with the invention, the higher C_8-C_{18} alkyl groups denote alkyl groups containing a linear or branched chain comprising from 8 to 18 carbon atoms, such as octyl, nonyl, decyl, undecyl, dodecyl,

tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl and octadecyl radicals.

In one preferred embodiment, one of the alkyl radicals R_1 and R_2 in an α - ω position represents an 5 octadecyl group and the other represents a methyl group. The associative polyurethanes used in the compositions of the present invention are used in the form of an aqueous suspension or solution optionally containing a certain amount of soluble starch. This 10 starch can be any starch extracted from natural sources, such as wheat starch, corn starch, rice starch, potato starch, etc., and which has been chemically, enzymatically or microbiologically modified so as to be soluble in water.

15 A preferred polymer is sold by the company Rohm & Haas under the name Acrysol 46. It is a polyurethane obtained by coupling hexamethylene diisocyanate and polyethylene glycol, and bearing at its ends, respectively, on average one methyl residue 20 and one octadecyl residue. This polymer is in the form of an aqueous solution containing 15% by weight of active polyurethane material and also containing 3-5% of an enzymatically modified starch matrix.

The fatty-chain anionic polymers of the 25 present invention constituting the component (B) are, in particular, polymers comprising units derived from carboxylic acids, from phosphonic acids or from

sulphonic acids, and at least one unit bearing a fatty chain.

The anionic groups are chosen, for example, from groups derived from carboxylic acids, such as 5 acrylic acid, methacrylic acid, crotonic acid, maleic acid, fumaric acid or itaconic acid, sulphonic acids, such as vinylsulphonic acid or styrenesulphonic acid, or phosphonic acids, such as vinylphosphonic acid or styrenephosphonic acid.

10 The fatty-chain anionic polymers of the
present invention can also contain one or more nonionic
units that are well known in the art, for example units
derived from vinyl, olefinic, styrene, acrylic or
methacrylic monomers. Examples of such monomers which
15 may be mentioned are ethylene, propylene, styrene,
vinyl acetate and alkyl acrylates and methacrylates.

The fatty chains are linear or branched C₈-C₂₂ alkyl groups. They can be derived from monomers such as C₈-C₂₂ alkyl acrylates or methacrylates or vinyl esters of higher C₈-C₂₂ fatty acids.

The fatty-chain anionic polymers of the present invention can be prepared by copolymerizing anionic monomers and monomers comprising at least one fatty chain, and optionally nonionic monomers. It may 25 also be envisaged to prepare them by introducing the anionic groups and the fatty chains by grafting or chemical modification of natural or synthetic polymers.

Examples of preferred anionic polymers of the present invention which may be mentioned are terpolymers of acrylic acid, vinylpyrrolidone and C₈-C₁₈ alkyl methacrylate, for example lauryl methacrylate, 5 such as the product sold under the name Acrylidone LM by the company ISP; terpolymers of vinyl acetate, monoisobutyl maleate and a C₁₀-C₂₀ vinyl alkanoate, for example vinyl neodecanoate, such as the product sold under the name Meypro-Fix 509 by the company Rhône 10 Poulenc Surfactants; and the terpolymers of vinyl acetate, of crotonic acid and of a C₁₀-C₂₀ vinyl alkanoate, for example vinyl neodecanoate, such as the product sold under the name National 28-2930 by the company National Starch.

15 According to the invention, the associative polyurethanes and the fatty-chain polymers are used in amounts which are sufficient to obtain satisfactory thickening or gelation of the aqueous medium.

An amount of associative polyurethanes of 20 between 0.1 and 10% by weight, and preferably between 0.5 and 5% by weight, expressed as active material and relative to the total weight of the composition, is recommended in particular.

In the compositions of the present invention, 25 the anionic polymers comprising at least one fatty chain are present in a proportion of from 0.01 to 10% by weight, preferably in a proportion of from 0.1 to 5%

by weight, of active material relative to the total weight of the composition.

In the present invention, the ratio of the said nonionic associative polyurethane (A), of formula 5 (I) to the said anionic polymer comprising at least one fatty-chain monomer unit (B) is preferably within the range from 90/10 to 10/90.

The cosmetically acceptable medium preferably consists of water and can also contain cosmetically 10 acceptable solvents, for example lower monoalcohols such as ethanol or isopropanol, glycols such as diethylene glycol, glycol ethers such as ethylene glycol alkyl ether or diethylene glycol alkyl ether, or alternatively fatty acid esters, all these solvents 15 being used alone or in the form of a mixture.

The haircare or styling gels can also contain one or more additives commonly used in such hair compositions. Examples which may be mentioned are fragrances, dyes, preserving agents, sunscreens, 20 vitamins, pH regulators, etc. It is clearly understood that the choice of these compounds should take into account any interactions with the thickening system. A person skilled in the art will take care to ensure that the addition of these additives will not have an 25 unfavourable effect on the advantageous properties of the compositions obtained by virtue of the present invention.

A preferred cosmetic process for treating the hair, according to the invention, consists in applying and uniformly distributing the compositions described above on the hair and in drying the hair thus treated 5 without rinsing it.

The examples which follow are intended to illustrate the invention without thereby being limiting in nature.

10 **Example 1**

The aqueous compositions below are prepared:

Acrysol 46, a product sold by the company Rohm & Haas, a polyurethane obtained by coupling 15 hexamethylene diisocyanate and polyethylene glycol, and bearing at its ends, respectively, on average one methyl residue and one octadecyl residue. The resin National 28-2930 sold by the company National Starch is an anionic terpolymer obtained by copolymerizing vinyl 20 acetate, crotonic acid and vinyl neodecanoate.

This example shows that the combination of the preferred associative polyurethane of the present invention (Acrysol 46) and a fatty-chain anionic polymer (National 28-2930) makes it possible to obtain 25 a gel which has excellent cosmetic properties. Hair treated with this composition A is easy to disentangle and feels smooth and supple.

It is noted that Acrysol 46 alone (composition B) has no appreciable thickening effect, let alone a gelling effect.

Composition A also has the advantage of being 5 creamy and non-greasy and of not being sticky.

Example 2

A care gel having the composition below was 10 prepared:

Acrysol 46	2% active material
Acrylidone LM*	1% active material
2-Amino-2-methyl-1-propanol	qs neutralization
Fragrance, dye, preserving	
15 agent and demineralized water	qs 100 g

*Acrylidone LM is an anionic terpolymer obtained by copolymerizing acrylic acid, vinylpyrrolidone and lauryl methacrylate (68/23/9%), sold by the company I.S.P.

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Example 3

A care gel having the composition below was prepared:

25 Acrysol 46	2% active material
Acrylidone LM	2% active material
2-Amino-2-methyl-1-propanol	qs neutralization
Fragrance, dye, preserving	

agent and demineralized water qs 100 g

Example 4

5 A care gel having the composition below was
prepared:

Acrysol 46 3% active material

Meypro-Fix 509* 2% active material

2-Amino-2-methyl-1-propanol qs neutralization

10 Fragrance, dye, preserving

agent and demineralized water qs 100 g

15 Meypro-Fix 509 is an anionic terpolymer of vinyl
acetate, monoisobutyl maleate and vinyl neodecanoate,
sold by the company Rhône-Poulenc Surfactants.

It is clearly understood that the description
hereinabove has been given for purely illustrative
purposes and without any limitation being implied, and
that variants or modifications may be made in the
20 context of the present invention.